# Bristol City Council Clean Air Plan

# Outline Business Case

## COBALT – Accident impact assessment

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## Project Name

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## Contents

# 1. Introduction

## 1.1 Context

Poor air quality is the largest known environmental risk to public health in the UK[1]. Investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments, as well as for Bristol City Council (BCC). BCC has monitored and endeavoured to address air quality in Bristol for decade and declared their first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide ($NO_2$) and these are predicted to continue until around 2029 without intervention.

The UK has in place legislation transposing requirements in European Union law, to ensure that certain standards of air quality are met, by setting Limit Values on the concentrations of specific air pollutants. In common with many EU member states, the EU limit value for annual mean nitrogen dioxide ($NO_2$) is breached in the UK and there are on-going breaches of the $NO_2$ limit value in Bristol. The UK government is taking steps to remedy this breach in as short a time as possible, with the aim of reducing the harmful impacts on public health. Within this objective, the government has published a UK Air Quality Plan and a Clean Air Zone Framework, both published in 2017. The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ).

Due to forecast air quality exceedances, in 2017 Bristol City Council has been directed by the Minister Therese Coffey (Defra) and Minister Jesse Norman (DfT) to produce a Clean Air Plan to achieve air quality improvements in the shortest possible time. In line with Government guidance, as part of the Plan, Bristol City Council has considered a range of options for the implementation of a Clean Air Zone (CAZ), including both charging and non-charging measures, in order to achieve sufficient improvement in air quality and public health and in line with legal requirements as set out below. This process requires the production of a Strategic Outline Case, an Outline Business Case (this report and a Full business Case, that will be prepared following the Outline Business Case.

Jacobs has been commissioned to support BCC to produce an Outline Business Case (OBC) for the delivery of the CAP; a package of measures which will bring about compliance with the Limit Value for annual mean $NO_2$ in the shortest time possible in central Bristol. The OBC assesses the shortlist of options set out in the Strategic Outline Case[2], and proposes a preferred option including details of delivery. The OBC forms a bid to central government for funding to implement the CAP. This report provides information about the COBALT assessment, which is used in the economic analysis work reported in business case.

## 1.2 Bristol CAP Options

A series of four CAP options are being appraised in the OBC. The CAP options are not discrete in that elements of the options are common, albeit that the combination of elements varies between options. Two aspects that are included in all options are the two areas that could be designated Clean Air Zones (CAZ) that have been identified. Within the CAZ areas, various options for charging or restricting vehicle use are included in the options. The four options are described briefly below:

1) **Option 1** – Medium area CAZ 'C' (charging non-compliant vehicles, including taxis, LGVs, HGVs, buses and coaches), scrappage scheme for old diesel cars, traffic management measures, localised diesel car ban on Marlborough Street between Park Street and St. James Barton roundabout, M32 & Cumberland Road bus lane, M32 Park and Ride and HGV bans on key links in the city centre with exceedances.
2) **Option 2** – Small area CAZ with 8-hour car diesel ban (7am-3pm).
3) **Medium area CAZ 'D'** – (charging non-compliant vehicles, including cars, taxis, LGVs, HGVs, buses and coaches) scrappage scheme for old diesel cars, traffic management measures, localised diesel car ban on

[1] Public Health England (2014) Estimating local mortality burdens associated with particular air pollution. https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution
[2] Bristol City Council Clean Air Plan: Strategic Outline Case, April 2018 (https://www.cleanairforbristol.org/wp-content/uploads/2018/05/Strategic-Outline-Case_BCC_Final_05.04.18.pdf)

Marlborough Street between Park Street and St. James Barton roundabout, M32 & Cumberland Road bus lane, M32 Park and Ride and HGV bans on key links in the city centre with exceedances.[3]

4) **Hybrid** – combination of most of the elements from options 1 and 2: Medium area CAZ 'C' (charging non-compliant vehicles, including taxis, LGVs, HGVs, buses and coaches), scrappage scheme for old diesel cars, traffic management measures, M32 Park and Ride, HGV bans on key links in the city centre with exceedances; plus an 8-hour car diesel ban (7am-3pm) in the small CAZ area.

## 1.3 Purpose of this Report

This report sets out the COBALT assessments carried out for the CAP options. This report supports the economic case of the Outline Business Case (OBC).



[3] Marlborough Street is the only location an HGV ban is suggested, in the Options Assessment Report (OAR)

# 2. Methodology

## 2.1 COBALT

COBALT (Cost and Benefit to Accidents – Light Touch) is the Dft's software for assessing, as part of an economic appraisal, the impact of a scheme on accidents. Assessments carried out made use of the latest release of COBALT (version 2013.02).

There are two main data inputs related to the scenarios being tested; these are:

- Forecast traffic flows – taken from the GBATS4 transport model; and
- Accident data – this is typically taken from STATS19 records of accidents, and usually covers the period for the last 5 years' data is available)

The COBALT software then uses two input files:

- Scheme-specific input files containing a definition of the highway network under consideration, traffic flows and relevant accident data (as above); there is one 'scheme file' for each CAP option assessed using COBALT; and
- Economic parameter file – this is supplied by the DfT and includes parameters such as the costs of accidents and cost growth rates, as well as default accident rates for road types (which can be used where the accident record is incomplete). The economic parameter file is periodically updated to reflect changes to economic data; the version used for this work (2018.1) is consistent with the May 2018 update of the WebTAG Data Book.

The software has two main approaches to defining the network – the network can be defined separately for 'links' and 'junctions', or with information pertaining to junctions 'combined' into that for adjacent links. The 'combined' (link and junction accidents) method was used in which the accident benefits for links are calculated in such a way that the accidents at junctions are included with those on links. Outputs include change in the number of accidents, by severity, and the associated costs/benefits.

## 2.2 Scenario tests

All four of the CAP options have been assessed using COBALT:

- Option 1 – Medium area CAZ 'C';
- Option 2 – Small area CAZ with 8-hour car diesel ban (7am-3pm);
- Medium area CAZ 'D'; and
- Hybrid – combination of most of the elements from options 1 and 2.

The scenarios have been assessed using traffic flow data for two forecast years, 2021 and 2031, and the results extrapolated over a 60-year period, from the assumed scheme opening year of 2021 to 2080. The impact of the two scenarios has been compared with a Do Minimum scenario in which the CAZ is not implemented.

## 2.3 Transport model data

The definition of the highway network and the forecast traffic flows are taken from the GBATS4 transport model, which is described in more detail in the T3 Methodology Report appended to the Outline Business Case. For each link in the network data the link type (capacity index), free-flow speed, traffic flow and link length are extracted from the model and converted to the format required by COBALT. Traffic flows for the three modelled time periods are expanded to give an Annual Average Daily Traffic figure.

The impact of the CAZ scheme covers most of the GBATS4 modelled area. Initial COBALT tests were carried out using the entire extent of the model network, but sensitivity tests shown that a proportion of the benefits

were being generated by a small number of longer links representing the road network outside the greater Bristol area (e.g. M4 to London). These links were removed from subsequent tests.

The link types in COBALT are defined on a different basis than in GBATS4, so a correspondence between the two systems was set up to convert the model capacity index to the COBALT link type. Several sensitivity tests were carried which showed that the results were not significantly altered by changing the allocation of link types.

COBALT requires the speed limit on each link and an initial allocation was made based on the GBATS4 free-flow speed, rounded up to the nearest 10mph. However, COBALT assumes that there are no accidents on roads with a 20mph speed limit, so to avoid underestimation, all roads with a 20mph speed limit were assigned a speed limit of 30mph. Also, as number of motorway links in the model have free-flow speeds of less than 70mph, a sensitivity test was carried out to determine whether this should be raised, but altering the motorway speed limits did not have a significant impact on outputs.

GBATS4 includes spigots where traffic is loaded (via centroid connectors) on to the road network. These were retained in the COBALT network to represent, to some extent, accidents on more minor roads.

## 2.4 Accident data

Observed accident data for the area covered by the GBATS4 model was obtained from the Dft. This, STATS19 data, provided information on location, date and severity of each accident. It was mapped onto the base network to provide the number of accidents on each COBALT link, by year, for the five years from 2012 to 2016 inclusive.

Links which appear in the forecast network only are allocated default accident rates by COBALT (drawn from the economic parameter file as noted).

# 3. Outputs

Table 3.1 sets out the results of COBALT assessments of the four CAP options.

Traffic movement changes caused by Option 2 and the Hybrid Option result in higher accident benefits than either Option 1 or the Medium CAZ 'D' option.

Table.3.1: COBALT results for the CAP options

| | | Option 1 | Option 2 | Medium CAZ 'D' | Hybrid option |
|---|---|---|---|---|---|
| **Economic Summary** | | | | | |
| Without-Scheme Accident Costs | | 2,861,071 | 2,861,071 | 2,861,071 | 2,861,071 |
| With-Scheme Accident Costs | | 2,841,770 | 2,826,826 | 2,837,021 | 2,825,337 |
| Accident Benefits saved | | 19,301 | 34,245 | 24,050 | 35,734 |
| **Accident Summary** | | | | | |
| Without-Scheme Accidents | | 73,095.8 | 73,095.8 | 73,095.8 | 73,095.8 |
| With-Scheme Accidents | | 72,595.2 | 72,203.6 | 72,471.0 | 72,169.7 |
| Accidents saved | | 500.7 | 892.3 | 624.8 | 926.2 |
| **Casualty Summary** | | | | | |
| Without-Scheme Casualties | Fatal | 825.5 | 825.5 | 825.5 | 825.5 |
| | Serious | 8,674.5 | 8,674.5 | 8,674.5 | 8,674.5 |
| | Slight | 94,699.6 | 94,699.6 | 94,699.6 | 94,699.6 |
| With-Scheme Casualties | Fatal | 820.6 | 817.1 | 819.4 | 816.1 |
| | Serious | 8,613.7 | 8,565.3 | 8,598.6 | 8,563.0 |
| | Slight | 94,068 | 93,586 | 93,911 | 93,523 |
| Casualties saved by Scheme | Fatal | 4.9 | 8.4 | 6.1 | 9.3 |
| | Serious | 60.8 | 109.2 | 75.9 | 111.5 |
| | Slight | 632.1 | 1,113.3 | 788.2 | 1,177.0 |

Note: All costs and benefits discounted to 2010 in £'000s